BICEPS CURL MACHINE

Related Application

This application claims priority from U.S. Provisional Patent Application No. 60/299,538, filed 20 June 2001, entitled "Biceps Curl Machine."

Field of the Invention

The present invention relates generally to exercise machines, and more specifically to exercise machines that exercise the biceps muscles of a user.

Background of the Invention

Exercise devices, and in particular weight training machines, typically include one or more mechanical members that the user repeatedly moves along a prescribed path for exercise. Conventionally, movement of the mechanical member is resisted in some fashion (often by weights) to render the movement more difficult and thereby intensify the exercise. The movement of the mechanical member determines what muscle or muscle groups are to be involved in the exercise.

One popular exercise movement for weight training is the "biceps curl" motion, in which an exerciser substantially straightens his arms at the elbow to grasp a handle or other grasping device, and bends (or "curls") his arms while maintaining the upper arms or elbows in a substantially stationary position. This exercise movement tends to work the biceps brachii, biceps brachialis, and forearm flexors of the user.

Some biceps curl machines include a frame that has a base and vertical uprights that rise from the base, a seat that is mounted to the frame, and a pair of movement arms that are pivotally mounted to and extend inwardly from the vertical uprights. Support pads for the user's elbows extend inwardly from the vertical

uprights. The user sits on the seat, rests his elbows on the supports, grasps the movement arms with his arms straight, and curls his arms such that the movement arms pivot relative to the frame. This movement is resisted by weights or other resistance system.

In many biceps extension machines of this general configuration, planes defined by each vertical upright are generally parallel with one another. The axes of rotation of the movement arms tend to be substantially normal to these planes. As a result, the movement arms are positioned in front of a seated user. This configuration may be inconvenient for a user as he enters the machine; often the movement arm must be moved out of the way in order for the user to sit. In addition, the parallel relationship of the axes of rotation may inhibit complete contraction of the biceps muscle.

Summary of the Invention

The present invention is directed to a biceps curl machine that can enable a user to enter the machine easily and can encourage complete contraction of the biceps muscles. In some embodiments, the machine includes: a frame configured to rest on an underlying surface; a seat mounted to the frame and configured to receive a seated user; a pair of support pads mounted to the frame forwardly of and above the seat, each of the support pads being positioned to engage one of the upper arms and the elbows of the seated user; a pair of movement arm units pivotally interconnected with the frame and movable about respective generally horizontal axes of rotation; and a resistance system connected with the movement arm units. Each of the pair of movement arm units is configured to engage the forearms and/or the hands of the user and is movable between an extended position, in which the seated user's arms are substantially straight, and a curled position, in which the user's arms are bent. The axes of rotation form an angle of between about 115 and 155 degrees. The resistance system provides resistance to rotation of the movement arm units as they move from the extended position to the curled position. In this configuration, the machine can enable an exerciser to easily enter the machine for exercise and can encourage complete contraction of the biceps.

As another aspect, the present invention is directed to a biceps curl machine that can provide more efficient exercise of the biceps muscles through selective

positioning of the user's elbows. Such a biceps curl machine comprises: a frame configured to rest on an underlying surface; a seat mounted to the frame and configured to receive a seated user; a pair of support pads mounted to the frame forwardly of and above the seat, each of the support pads being positioned to engage one of the upper arms and the elbows of the seated user; a pair of movement arm units pivotally interconnected with the frame and movable about respective generally horizontal axes of rotation, each of the pair of movement arm units being configured to engage the forearms and/or the hands of the user, each of the pair of movement arm units being movable between an extended position, in which the seated user's arms are substantially straight, and a curled position, in which the user's arms are bent; and a resistance system connected with the movement arm units that provides resistance to rotation of the movement arm units as they move from the extended position to the curled position. The elevation of the seat and the support pads are such that, when a user is seated and the user's elbows or upper arms engage the support pads, the user's upper arms are angled upwardly from shoulder to elbow at an angle of at least 10 degrees. This configuration can allow more complete contraction of the biceps muscles of the user.

Brief Description of the Figures

Figure 1 is a perspective view of a biceps curl machine of the present invention.

Figure 2 is a side view of the machine of **Figure 1**, with the extended exercise position shown in bold line and the curled position shown in phantom line.

Figure 3 is an exploded view of the frame, cam assemblies, handle assemblies, and seat assembly employed with the machine of the present invention.

Figure 4 is a perspective view of the weight stack employed with the machine of the present invention.

Figure 5 is a schematic view of the belt-pulley system of the machine of the present invention.

Figure 6 is a partial top view of the frame of the machine of the present invention.

Figure 7 is a partial side view of the frame and seat support member of the machine of the present invention.

Figure 8 is a graph plotting resistance as a function of cam angle for certain embodiments of the present invention.

Detailed Description of the Invention

The present invention will now be described more fully hereinafter, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, like numbers refer to like elements throughout. Thicknesses and dimensions of some components may be exaggerated for clarity.

A biceps extension machine, designated broadly at **10**, is illustrated in **Figures 1-7**. The machine **10** includes a frame **11**, a weight stack **12**, a seat assembly **13**, two movement arm units **40**, and two pulley systems **50, 60**. These components are described in more detail below.

Referring to **Figures 1-3, 6** and **7**, the frame **11** includes a base **14** with legs **14a, 14b** and a cross member **14c**, rear uprights **15a, 15b** that extend upwardly and forwardly from rear portions of the legs **14a, 14b**, and front uprights **16a, 16b** that extend upwardly from front portions of the legs **14a, 14b**. The rear and front uprights **15a, 16a** define plane P_1 and the rear and front uprights **15b, 16b** define a plane P_2. The planes P_1, P_2 form an angle α (see **Figure 6**) of between about 20 and 70 degrees, with an angle α of between 35 and 45 degrees being preferred, and an angle α of about 40 degrees being most preferred. This angular arrangement can provide easy access into the machine **10** for a user. As noted above, prior machines, particularly those that have frame arms and uprights that are parallel to one another, may require that the movement arm be raised in order for the user to be seated for exercise. A respective pad arm **17a, 17b** extends inwardly and upwardly from each front upright **16a, 16b** to terminate at a position just below the horizontal portions of the rear uprights **15a, 15b**. A support pad **18** is attached to the upper end of each pad arm **17a, 17b** in position to engage the upper arms or elbows of the user. A seat mounting platform **19** is mounted to the forward edge of the cross member **14c**.

Those skilled in this art will appreciate that the frame **11** may take alternative forms. For example additional uprights may be employed, or certain components may be formed from multiple pieces.

Referring now to **Figures 1, 2** and **4**, the weight stack **12** is positioned on the leg **14b** and includes a plurality of weights **20** arranged in a vertical stack. Two guide rods **21a, 21b** extend vertically from the leg **14b** to the upper portion of the rear upright **15a**; the weights **20** have apertures that receive the guide rods **21a, 21b** such that the weights are free to slide vertically thereon. An elongate lifting member **22** extends through an aperture in the center of each weight **20**. The lifting member **22** includes apertures **23** that can receive a pin **24**. An auxiliary weight stack **25** includes a pair of lighter weights **26** that slide on a guide rod **27** that also extends from the leg **14b** to the upper portion of the rear upright **15b**. An auxiliary weight bracket **28** is attached to the uppermost weight **20** and to a stack pin **28a** that fits within a groove in the guide rod **27** and includes apertures to receive a pin **29** for the selection of weights **26**.

Those skilled in this art will appreciate that other resistance systems may be employed with the present invention. For example, other weight stack configurations, friction-imparting devices, variable viscosity devices, air drag-based resistance devices, and the like, may also be employed with a machine of the present invention. Exemplary resistance devices include those illustrated in U.S. Patent Nos. 5,810,696; 4,708,338; 4,720,093; 5,033,733; 4,542,897; 4,298,893; 4,805,901; 4,790,528; 4,786,049; 5,031,900; 4,775,145; 4,589,656; and 4,659,074, the disclosures of each of which are hereby incorporated herein by reference in their entireties.

The seat assembly **13** includes a support member **33** that is mounted to the seat mounting platform **19** and extends upwardly and rearwardly therefrom. Preferably, the support member **30** reclines at an angle β (**Figure 7**) with the underlying surface that is between about 60 and 80 degrees, and more preferably between about 70 and 80 degrees, with 75 degrees being most preferred. A track **31** with a serrated front surface **32** is mounted to the front surface of the support member **30**. A seat bracket **33** is mounted to the track **31** (**Figure 3**) such that the rear edge thereof mates with one of the serrations in the track front surface **32**. A seat **34** is mounted on the upper surface of the seat bracket **33**. The interaction between the seat bracket **33** and the serrations in the track front surface **32** enable the seat **34** to be adjusted vertically to a

number of discrete positions along the track **31**. A backrest **35** is mounted to a backrest support **36**, which is in turn mounted to the support member **30** above the seat **34**; the reclining angle of the backrest support **36**, and in turn the backrest **35**, can be adjusted as desired.

Referring to **Figures** 1 and **3**, each of the movement arm units **40** is pivotally attached to the frame **11**; only one movement arm unit **40** will be described in detail herein, as the movement arm units **40** are essentially mirror images of one another. A cam **41** is pivotally attached to an upper portion of each front upright **16a, 16b** via a pivot pin **41a** that extends through an aperture in a respective front upright **16a, 16b**. The cam **41** has a camming surface **41b**. A lever arm **42** extends forwardly and slightly upwardly from each cam **41** and terminates in a hollow, elongate bearing hubs **43**. An S-shaped handle **49** includes a grip portion **44**, an intermediate portion **45** that merges with the grip portion **44**, and a mounting portion **46** that is received within and pivots relative to the bearing hubs **43** of the cam assembly **40**. Thus, each handle **49** is free to pivot relative to its corresponding lever arm **42** about a respective axis of rotation **A1, A2**, and each cam **41** is free to pivot relative to its corresponding upright **16a, 16b** about a respective axis of rotation **B1, B2** that is substantially parallel with its corresponding axis of rotation **A1, A2**. Notably, the axis **A1** defines an angle γ (Fig. 6) which is between about 115 and 155 degrees with the axis **A2**, and more preferably is between 135 and 145 degrees, with 140 degrees being most preferred; consequently, the axis **B1** forms a similar angle with the axis **B2**. Also, it is notable that the axes **A1, A2, B1, B2** are substantially perpendicular to the respective planes $\mathbf{P_1}$, $\mathbf{P_2}$ defined by the arms **14a, 14b** and their respective rear and front uprights **15a, 15b, 16a, 16b**.

The configuration of the camming surface **41b** controls the resistance curve experienced by the user during exercise. Fundamentally, it is typically desirable to vary the resistance experienced by the user at different points during movement; otherwise, the magnitude of resistance necessary to provide a strengthening workout to a muscle or muscle group may be too high to enable the user to move the movement arm unit **40** through positions within the full range of motion in which the user enjoys a lower mechanical advantage. In the illustrated embodiment, the non-circular camming surface **41b** of the cam **41** causes the resistance experienced by the user to follow the resistance curve illustrated in **Figure 8**. Those skilled in this art will recognize that, although a

non-circular cam is preferred to provide a varying resistance curve to the machine **10**, other structures, such as four-bar linkages and the like, can also be employed to vary the resistance of the machine during exercise.

The movement arm units **40** are interconnected with the weight stack **12** via two pulley systems **50, 60 (Figure 5)**. The pulley system **50** includes a belt **51** that is attached to the forward portion of the perimeter of one cam **41**. The belt **51** follows the contour of the camming surface **41b** as the belt travels rearwardly, then extends upwardly to a pulley **52** mounted to an upper portion of one rear upright **15a**, extends downwardly to a pulley **53** mounted to one end of a floating pulley bracket **54** (seen best in **Figure 3**), extends horizontally to a pulley **55** mounted to the other end of the floating pulley bracket **54**, extends upwardly to a pulley **57** mounted on the opposite rear upright **15a**, and terminates by following the contour of the other cam **41** and attaching to the forward perimeter portion thereof. The pulley system **60** includes a belt **61** that is attached to the lifting member **22** and extends upwardly over a pulley **62** attached to a forward portion of a pulley mounting bracket **63** attached to the upper portion of the frame **11**, rearwardly to a pulley **64** attached to the rear portion of the pulley mounting bracket **63**, downwardly to a pulley **65** attached to a bracket **69** attached to the lower end of the rear upright **15a**, horizontally to a pulley **66** mounted via a pin **67** to the cross member **14c**, and upwardly to fixedly mount to a pin **68** mounted to the lower central portion of the floating pulley mounting bracket **54**.

Those skilled in this art will recognize that, although the pulley systems **50, 60** are employed to interconnect the weight stack **12** and the movement arm units **40**, other systems that connect the movement arm units and the chosen resistance system, such as cables, chains, and the like, may be suitable for use with the present invention.

In operation, the user selects a desired weight by inserting the pin **24** into an aperture in the individual weight **20** that provides the user with a stack of weights **20** that corresponds to the desired exercise resistance (and, if desired, inserts the pin **29** to select one or both auxiliary weights **26**). The user then adjusts the seat assembly **13** to the desired height (preferably one in which the user's elbows align with the axes of rotation **B1, B2**) by manipulating the seat **34** until the seat bracket **33** mates with a desired serration on the track front surface **32**. The user may also adjust the angle of the backrest **35**. The user then sits upon the seat **34**, rests his back against the backrest **35**, grasps the grip portions **44** of the handles **49**, and places his elbows on the pads **18** with his arms extended (see **Figure 2** in solid line).

It is preferred that the seat height be such that the user's upper arms are angled upwardly from shoulder to elbow; an angle of at least 5 degrees is preferred, with an angle of at least 10 degrees being more preferred. Doing so can have the effect of stretching the biceps and latissimus dorsi. Because both heads of the biceps brachii originate from locations on the scapula (located behind the shoulder joint) and insert on the radius, raising the elbows can provide a posture in which contraction of the biceps can be complete (in contrast, a lower position of the elbows may cause that head of the biceps to be less than completely contracted even when the user can flex no further during the exercise). More complete contraction of the arm during flexure can increase exercise intensity and efficiency. The coracobrachialis can also benefit from raising of the elbows.

Exercise is performed by the user bending his arms at the elbows, thereby drawing the grip portions **44** of the handles **49** toward his shoulders to a curled position (see **Figure 2** in phantom line). This movement causes the cams **41** to pivot relative to the rear uprights **15a** and take up some of the belt **51** (when viewed from the right side of the user, both cams **41** pivot counterclockwise). As the cams **41** take up the belt **51**, the shortening of the belt **51** causes the floating pulley bracket **54** to rise, which in turn draws the end of the belt **61** attached to the pin **67** of the floating pulley bracket **54** upwardly. As the end of the belt **61** rises, it draws the selected weights **20** in the weight stack **12** upwardly, thereby providing resistance to the user. This exercise movement exercises the biceps brachii, biceps brachialis, and forearm flexors. Once the user has bent his arms, he then straightens them to return the movement arm units **40**, the weights **20** and the pulley systems **50, 60** to their original positions.

As noted above, the relationships between the axes of rotation **A1, A2** and **B1, B2** are defined by the angle γ. When the angle γ is of the magnitude described above, exercise can be more intense and efficient because, similar to that described for the raising of the elbows, the origin of the biceps within the shoulder can allow arm flexure can be more complete.

The foregoing is illustrative of the present invention and is not to be construed as limiting thereof. Although exemplary embodiments of this invention have been described, those skilled in the art will readily appreciate that many modifications are

possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention.